CLAIMS

1. A processor-readable medium comprising processor-executable instructions for mapping color data, the processor-executable instructions comprising instructions for:

adjusting a degree to which BG color coefficient generation is similar for process-neutral and K-only neutral images to produce BG coefficients;

adjusting a degree to which UCR color coefficient generation is similar for process-neutral and K-only neutral images to produce UCR coefficients; and

mapping CMY color data to CMYK color data using the produced BG coefficients and the produced UCR coefficients.

2. The processor-readable medium as recited in claim 1, wherein adjusting the degree to which BG color coefficient generation is similar includes instructions for:

using similar BG coefficients for a color in both process-neutral and K-only images, wherein the color is greater than a distance from a neutral line;

using dissimilar BG coefficients for a color in both process-neutral and K-only images, wherein the color is less than the distance from the neutral line; and

controlling the distance.

3. The processor-readable medium as recited in claim 2, wherein controlling the distance includes instructions for:

setting the distance based on whether the process-neutral and K-only neutral images will be printed side-by-side.

4. The processor-readable medium as recited in claim 1, wherein adjusting the degree to which UCR color coefficient generation is similar includes instructions for:

using similar UCR coefficients for a color in both process-neutral and K-only images, wherein the color is greater than a distance from a neutral line; and

using dissimilar UCR coefficients for a color in both process-neutral and K-only images, wherein the color is less than the distance from the neutral line.

5. The processor-readable medium as recited in claim 1, wherein adjusting the degree to which UCR color coefficient generation is similar includes instructions for:

assigning a greater value to UCR coefficients of a minor color; and

assigning a lesser value to UCR coefficients of more dominate colors.

6. The processor-readable medium as recited in claim 1, wherein the mapping includes instructions for:

moving points in a process-neutral color space, thereby mapping the CMYK data to reduce color in neutral colors in process-neutral images.

7. The processor-readable medium as recited in claim 6, wherein moving points in a process-neutral color space includes instructions for:

mapping the process-neutral color space into a color space defined in Lab;

establishing a first vector between a point on a neutral axis and a point having a neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the color space defined in Lab;

establishing a third vector through the point having neutral hue and the point on the boundary of the color space defined in Lab;

establishing a fourth vector bisecting the second and the third vectors;

projecting the point to be moved onto the fourth vector; and

using formulas based on lengths of the vectors to move the point to be moved to a new location in the color space defined in Lab having similar L value.

8. The processor-readable medium as recited in claim 7, wherein using formulas includes instructions for:

mapping values of a and b by adding (dps/(db – constant * vml))*vm(1) and (dps/(db – constant * vml))*vm(2) respectively; and

mapping values of a and b by adding values a and b to the vector vm where the point to be moved is within a circle enclosing the first vector.

9. A method of controlling a degree to which a process-neutral image and a K-only neutral image are harmonized, comprising:

generating similar BG values for colors within the process-neutral image and the K-only neutral image beyond a first distance from a first neutral axis;

generating dissimilar BG values for colors within the process-neutral image and the K-only neutral image within the first distance from the first neutral axis;

generating similar UCR values for colors within the process-neutral image and the K-only neutral image beyond a second distance from a second neutral axis;

generating dissimilar UCR values for colors within the process-neutral image and the K-only neutral image within the second distance from the second neutral axis; and

mapping CMY color data to CMYK color data using the generated BG coefficients and the generated UCR coefficients.

10. The method of claim 9, wherein the mapping includes:

adjusting the first and second distances to balance color similarity between the process-neutral image and the K-only neutral image against a smooth transition from colors to neutral within the K-only neutral image.

11. The method of claim 9, wherein the mapping includes:

reducing color within a region adjacent to a neutral axis of a process-neutral color space by mapping the process-neutral color space into an Lab color space and moving a point within the Lab color space according to vectors connecting the point within the Lab color space, a point on a neutral axis in the Lab color space, a point on a boundary of the Lab color space and a point having neutral hue.

12. The method of claim 9, wherein the mapping includes:

mapping colors into a color space defined in Lab; and

mapping each point within the color space defined in Lab, wherein points along a process-neutral axis are mapped to more neutral colors.

13. The method of claim 12, wherein mapping each point includes:

establishing a first vector between a point on a neutral axis and a point having neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the color space;

establishing a third vector through the point having neutral hue and the point on the boundary of the color space;

establishing a fourth vector bisecting the second and the third vectors;

projecting the point to be moved onto the fourth vector; and

using formulas based on lengths of the vectors to move the point to be moved to a new location having a similar L value.

14. The method of claim 13, wherein using formulas includes:

applying a first formula wherein a point to be moved is within a circle enclosing the first vector; and

applying a second formula wherein the point to be moved is not within the circle enclosing the first vector.

15. A color mapping apparatus, comprising:

a BG module to generate BG coefficients for process-neutral and K-only images, and to adjust a degree to which the generation of BG coefficients is similar for the process-neutral and the K-only images;

a UCR module to generate UCR coefficients for process-neutral and K-only images, and to adjust a degree to which the generation of UCR coefficients is similar for the process-neutral and the K-only images; and

a mapping module to map CMK color data to CMYK color data using the generated BG coefficients and the generated UCR coefficients.

16. The color mapping apparatus of claim 15, where in the BG module comprises configurations for:

using similar BG coefficients to map a color in both process-neutral and K-only mapping, wherein the color is greater than a distance from a neutral line;

using dissimilar BG coefficients to map a color in both process-neutral and K-only mapping, wherein the color is less than the distance from the neutral line; and

controlling the distance to achieve a desired degree of harmony between the process-neutral and K-only images.

17. The color mapping apparatus of claim 15, where in the UCR module comprises configurations for:

using similar UCR coefficients to map a color in both process-neutral and K-only mapping, wherein the color is greater than a distance from a neutral line;

using dissimilar UCR coefficients to map a color in both process-neutral and K-only mapping, wherein the color is less than the distance from the neutral line; and

controlling the distance to achieve a desired degree of harmony between the process-neutral and K-only images.

18. The color mapping apparatus of claim 15, additionally comprising:

a neutral axis correction module to reduce color from a neutral axis of a process-neutral color space by moving points in the process-neutral color space to make the neutral axis less colorful.

19. The color mapping apparatus of claim 18, wherein the neutral axis correction module comprises configurations for:

mapping the process-neutral color space into Lab color space;

establishing a first vector between a point on the neutral axis and a point having neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the gamut;

establishing a third vector through the point having neutral hue and the point on the boundary of the gamut;

establishing a fourth vector bisecting the second and third vectors;

projecting the point to be moved onto the fourth; and

using formulas based on the vectors to move the point to be moved to a new location having similar L value with less color.

20. The color mapping apparatus of claim 19, wherein the neutral axis correction module additionally comprises configurations for:

mapping values of a and b by adding (dps/(db – constant * vml))*vm(1) and (dps/(db – constant * vml))*vm(2) respectively; and

mapping values of a and b by adding them to the vector vm where the point to be moved is within a circle enclosing the correction vector.

21. A color mapping apparatus, comprising:

means for generating similar BG values for colors within the process-neutral image and the K-only neutral image beyond a first distance from a first neutral axis;

means for generating dissimilar BG values for colors within the process-neutral image and the K-only neutral image within the first distance from the first neutral axis;

means for generating similar UCR values for colors within the process-neutral image and the K-only neutral image beyond a second distance from a second neutral axis;

means for generating dissimilar UCR values for colors within the process-neutral image and the K-only neutral image within the second distance from the second neutral axis; and

means for mapping CMY color data to CMYK color data using the similar and dissimilar BG and UCR values.

22. The color mapping apparatus of claim 21, wherein the means for mapping includes:

means for reducing color from a neutral axis of a process-neutral color space, within which the process-neutral image is defined, by moving points in the process-neutral color space to make the neutral axis less colorful.

23. The color mapping apparatus of claim 21, wherein the means for mapping includes:

means for mapping a process-neutral color space into a color space defined in Lab;

means for mapping each point within the color space defined in Lab to result in a less colorful neutral axis; and

means for mapping the color space defined in Lab into CMY or CMYK.

24. A processor-readable medium comprising processor-executable instructions for mapping color data, the processor-executable instructions comprising instructions for:

generating similar UCR values for process-neutral and K-only neutral color images beyond a distance from a neutral axis;

generating dissimilar UCR values for process-neutral and K-only neutral color images within the distance from the neutral axis; and

mapping CMY color data to CMYK color data using the generated UCR coefficients.

25. The processor-readable medium as recited in claim 24, additionally comprising instructions for:

weighting the UCR values for each color, wherein weight is applied as a function of a mixture of primary vs. secondary color.

26. The processor-readable medium as recited in claim 24, additionally comprising instructions for:

weighing the UCR values as a function of distance from the second neutral axis, wherein those colors that are further away from the second neutral axis than intermediate lines are weighted from the intermediate lines to color lines of both the primaries and secondaries, resulting in two weighted UCR values which are weighted according to percentage of primary and secondary color.

27. A processor-readable medium comprising processor-executable instructions for controlling a degree to which a process-neutral image and a K-only neutral image are harmonized, the processor-executable instructions comprising instructions for:

generating similar BG values for colors within the process-neutral image and the K-only neutral image beyond a distance from a neutral axis;

generating dissimilar BG values for colors within the process-neutral image and the K-only neutral image within the distance from the neutral axis; and

mapping CMY color data to CMYK color data using the generated BG coefficients.

28. The processor-readable medium as recited in claim 27, additionally comprising instructions for:

adjusting the distance to balance color similarity between the process-neutral image and the K-only neutral image against a smooth transition to the neutral axis in colors within the K-only neutral image.

29. The processor-readable medium as recited in claim 27, wherein the mapping includes instructions for:

reducing color within a region adjacent to the neutral axis by moving most or all points in a process-neutral color space within which the process-neutral axis is defined.

30. The processor-readable medium as recited in claim 27, wherein the mapping includes instructions for:

reducing color within a region adjacent to the neutral axis within a process-neutral color space by mapping process-neutral colors into an Lab color space and moving a point within the Lab color space according to vectors connecting the point within the Lab color space, a point on the neutral axis, a point on a gamut boundary and a point having neutral hue.